REMARKS

Status of Claims

Claims 1-13 are in the application. Claims 3, 8-9 and 13 have been cancelled. Claims 11 and 12 stand withdrawn.

Claim Objections

Claim 2 is objected to because in the newly added text "incompatible with the molecular species" in the last two lines of claim 2, it is unclear if applicant means the first or second molecular species. Based upon antecedence, the examiner has correctly assumed that applicant meant to claim "incompatible with the second molecular species."

Appropriate correction has been made.

Claim Rejections - 35 USC § 103

Claims 1, 2 and 4-7 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Delamarche et al. (J. Am. Chem. Soc. 2002, 124, 3834-3835) in view of Fleming et al. (US 6503564).

Delamarche et al. teach microcontact printing in which the printed regions of a substrate are etched rather than being protected, employing PTMP as an ink. [page 3834, col. 1, lines 1-4]. PTMP is applied to a portion of the surface of a substrate to prevent etching of the substrate under the PTMP layer. [page 3834, col. 1, paragraph 2].

Delamarche et al. teach both negative and positive microcontact printing [Figure 1] and suggest the positive microcontact printing is more flexible that negative microcontact printing.

Delamarche et al. does not mention the presence of a polar or nor-polar group

being required for the second SAM [SAM A in Delamarche et al.fig 1 B].

Delamarche et al. do not mention spreading the SAM beyond the stamp.

Delamarche et al. teach positive and negative microcontact printing. Delamarche et al. do not impliedly or directly teach microcontact printing where a SAM is allowed to migrate beyond the boundaries of an inked stamp.

As stated by the examiner, regarding claim 1, Delamarche et al. teach "a method of applying a self-assembled monolayer of a molecular species to a surface of an article (Figure 1A).

Delamarche et al. do not specifically teach "and allowing the molecular species to spread evenly from the first portion of the article surface to a second portion of the article surface, wherein the spreading is accomplished without immersion in a liquid incompatible with the molecular species."

However, the examiner states that Delamarche et al. teach that when forming a self-assembled monolayer (SAM), the stamp is left in contact for an amount of time (first full paragraph of page 3835).

The examiner states that one having ordinary skill in the art would recognize that the stamp is left in contact for an amount of time because the formation of SAMs is a kinetic process (that is, a process that is time-dependent), and therefore the stamp is left in contact with the article surface in order to allow the SAM to form on the article surface.

Applicant agrees but only insofar as the kinetics are such that the SAM would transfer to the area under the stamp and only later, if at all, to areas not under the stamp. And Delamarche et al. does not imply or expressly disclose maintaining the stamp for an amount of time in excess of that needed for transfer by direct contact.

The examiner states that one having ordinary skill in the art would also recognize that when a SAM-forming species is applied to a surface, due to surface tension effects and to gravity, the species will naturally spread on the surface referencing, for example, figure 2 of Delamarche et al.

But figure 2 of Delamarche et al. does not provide support for the examiner's position. Figure 2 shows only "how a droplet of deionized water wets" different surfaces, not the migration or non-migration of a SAM. In his own words, Delamarche et al. states and concludes only that "no or only few ECT molecules can adsorb on the Au substrate already covered with PTMP."

The examiner's statement also does not take into consideration the fact that Delamarche et al. does not recognize that some of the compositions used by applicant are autophobic [paragraph 0116].

The examiner concludes that "molecular species in the method taught by Delamarche et al. would 'spread evenly from the first portion of the article surface to a second portion of the article surface.'"

Here, the examiner's quote the SAM would "spread evenly from the first portion of the article surface to a second portion of the article surface" is taken out of context The surface Delamarche et al. is clearly referring to is the surface in direct contact with the stamp, not the entire surface of the object.

Further, even if the spread would, under certain circumstances, spread beyond the confines of the stamp, this spread would not be instantaneous and would require an additional increment of time beyond that required to transfer the ink beneath the surface of the stamp. One skilled in the art would be motivated to maintain the stamp in contact no longer than required to transfer the SAM to the area directly in contact for efficiency and clarity of the boundary absent applicant's disclosure.

Delamarche et al. does not impliedly or expressly disclose diffusion of the SAM beyond the boundaries of the stamp. The examiner's position is clearly contradicted by Delamarche et al. in Figure 1A and figure 1B where the SAM appears only with the precise boundaries of the stamp.

Furthermore, such diffusion is not inherent in the prior art because the spread is directly related to the contact time and conditions and will not necessarily occur.

Thus, "spreading beyond the boundaries of the stamped surface 1) is not a concept present to the art; 2) is not inherent in the stamping process because it is time, pressure and other condition dependent; 3) it is contraindicated by the very fact that the prior art desired precise boundaries to the stamped surface; 4) the spread beyond the boundaries of the stamp is inefficient for normal uses; and 5) the usefulness of allowing the spread beyond the boundaries is important and desirable only in the context of applicant's disclosure.

Fleming et al. does not fill this lacuna in the Office's attempt to make out a prima facie case. Fleming et al. is cited only as teaching a method of making a microstructured article wherein a reduced atmosphere is used in order to provide a clean environment.

For all the above reasons, applicant respectfully believes the Office has not made out a *prima facie* case and requests reconsideration of the rejection of claim 1.

Regarding claim 2, the examiner states that "Delamarche et al. teach "a method of applying self-assembled monolayers of two molecular species to a surface of an article (figure 1B),…".

Applicant agrees that figure 1B of Delamarche et al. shows a surface with a first portion covered by what Delamarche et al. refer to as "SAM B" and a second portion covered by what Delamarche et al. refers to as "SAM A". Significantly, figure 1B shows no overlap of SAM B on SAM A or vice versa. Even more significantly, Delamarche et al. does not show or imply a substrate where a second SAM [SAM 2]

is stamped only over an area of the substrate already covered by the first SAM [SAM 1].

Furthermore, Figure 1 is only a cartoon of Delamarche et al.'s method as more explicitly set out in Delamarche et al.'s figure 3.

As stated in the Office Action, Delamarche et al. fail to specifically teach that the second molecular species is applied via a stamping process.

Applicant directs the examiner's attention to Delamarche et al.'s figure 3 where the fundamental differences between Delamarche et al. and applicant's method, with regard to claim 2, are more apparent. Delamarche et al. requires the second SAM to be applied from solution incompatible with SAM 1.

Delamarche et al.'s disclosure is definitive on this point. First a reference to figure 2:

> "Immersing another Au substrate in a 0.3 mM solution of ECT in ethanol for at least 3 s results in a hydrophobic surface, Figure 2A. Exposing the Au sample with the adsorbed PTMP to a solution of ECT for 4 min does not change the PTMP/Au surface in terms of its wettability by water, Figure 2C. (page 3834, col. 2)."

Here Delamarche et al. is only stating that ECT is incompatible with PTMP.

More significantly, Delamarche et al. also state, in the caption to figure 3:

> *"Figure 3.* SEM images of structures made in Au and Cu with (+)uCP. (A) This Au surface was microcontact printed with PTMP, immersed in a 0.6 mM solution of ECT in ethanol for 15 s, and selectively etched. (B) This pattern was formed by microcontact printing PTMP on a Cu substrate, which was then exposed to a 0.3 mM solution of ECT in ethanol for 4 min and

> etched for 2 min 30 s in a 0.07 M aqueous solution of ammonium peroxodisulfate. (C and D) These high-resolution Cu structures result from microcontact printing Cu substrates with PTMP, immersing them into a 0.6 mM solution of ECT in ethanol for 2 min, and etching them for 3 min with ammonium peroxodisulfate." (emphasis supplied)

The examiner agrees that "Delamarche et al. simply teach 'plac[ing]' the second species.

Delamarche et al. have indicated that the first step involves "stamping" so it is not inadvertence that leads Delamarche et al. to use the word "placing" instead of stamping.

Furthermore, the context of "placing" in figure 1B is clearly and unequivocally over the portion of the substrate not covered by SAM B unlike applicant's invention as claimed in claim 2 which provides a "stamp" for transferring the second SAM on top of the first SAM.

Even if stamping were contemplated, there is no showing that the stamping is over the already stamped portion.

The examiner concludes that one having ordinary skill in the art would recognize that applying the second SAM-forming species on top of the first SAM-forming species by forcibly using a stamp would result in the second SAM-forming species spreading over the first SAM and then adhering to the surface of the article and forming a second SAM.

But this begs the question. Why would one skilled in the art do such a thing? Delamarche et al. states only that a property of ECT is that it cannot absorb to PTMP. Figure 3 of Delamarche et al. discloses that after imprinting with PTMP the entire substrate was immersed in ECT. But nowhere does Delamarche et al. suggest printing only over the PTMP to obtain, after further processing, nanometer wide

structures on a surface. Why would one skilled in the art go thought the extra effort of stamping when immersion is easier and more efficient?

Moreover, the examiner's position is contrary to the express teaching of the process actually used by Delamarche et al. as shown in figure 3 and the first full paragraph of page 3835.

The Office Action suggests that one having ordinary skill in the art would also recognize that applying pressure while applying the second species would speed up the coating process. Further, since the first SAM-forming species is applied via a stamp in the process of Delamarche, one having ordinary skill in the art would have been motivated to apply the second SAM-forming species to the article via a stamping process in order to effectively apply and distribute the second SAM-forming species.

But this is specifically contrary to the direct disclosure of Delamarche et al. who state in reference to both figures 2 and 3:

> Immersing another Au substrate in a 0.3 mM solution of ECT in ethanol for at least 3 s results in a hydrophobic surface, Figure 2A. Exposing the Au sample with the adsorbed PTMP to a solution of ECT for 4 min does not change the PTMP/Au surface in terms of its wettability by water, Figure 2C. (page 3834, col. 2)(emphasis added)

> *Figure 3.* SEM images of structures made in Au and Cu with (+)μCP. (A) This Au surface was microcontact printed with PTMP, immersed in a 0.6 mM solution of ECT in ethanol for 15 s, and selectively etched. (B) This pattern was formed by microcontact printing PTMP on a Cu substrate, which was then exposed to a 0.3 mM solution of ECT in ethanol ..." (caption to Figure 3) (emphasis added)

At page 8, lines 2-9, the examiner states:

> "... the molecular species in the method taught by Delamarche et al. would "spread evenly over the first monolayer to a second portion of the article's surface."
>
> Delamarche et al. further teach that, while the stamp is in contact, it is not immersed in an liquid which is incompatible with the molecular species; rather, the structures are formed by first stamping, *then* immersing in a liquid (see Figure 3, and first full paragraph of page 3835)."

Applicant respectfully believes the examiner has misinterpreted Delamarche et al.'s disclosure. What Delamarche et al. describes in Figure 3 is that the second SAM is deposited by immersion I an incompatible liquid:

> *Figure 3.* SEM images of structures made in Au and Cu with (+)μCP. (A) This Au surface was microcontact printed with PTMP, immersed in a 0.6 mM solution of ECT in ethanol for 15 s, and selectively etched. (B) This pattern was formed by microcontact printing PTMP on a Cu substrate, which was then exposed to a 0.3 mM solution of ECT in ethanol ..." (caption to Figure 3) (emphasis added)

Since claim 2 requires that the spreading of the second SAM is accomplished without immersion in n incompatible liquid, Delamarche et al. teaches directly away from applicant's method.

The remaining claims are all dependent upon claim 1 or 2 and since no prima facie case has been made with regard to claims 1 or 2, these claims are also not obvious.

Conclusion

An earnest effort has been made to be fully responsive to the Examiner's correspondence and advance the prosecution of this case. In view of the foregoing, it is

respectfully submitted that all the claims pending in this patent application are in condition for allowance.

If there are any errors with respect to the fees for this response or any other papers related to this response, the Director is hereby given permission to charge any shortages and credit any overcharges of any fees required for this submission to Deposit Account No. 14-1270.

Respectfully submitted,

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